

## Innovative Research Solutions with Industry

Medical Devices

**CLIENT:**  
Radisens Diagnostics

**AREA:**  
Medical Diagnostics:  
Optics & microfluidics



## Supporting development of new Point-of-Care diagnostic technology



Radisens Diagnostics develops disruptive Point-of-Care (PoC) diagnostic platforms and multiplexed test panels, which diagnose and monitor patients for multiple chronic and acute care conditions.

This is the only point-of-care platform to integrate immunoassay, biochemistry and cellular hematology onto a single test panel. Using a finger-prick of blood, the analyser returns laboratory-grade results in the doctor's office within minutes.

Radisens' platform utilises a Lab-on-disc approach where a disposable disc, with pre-stored reagents, takes the blood sample. A pathway of micro-fluidic channels, chambers and valves performs all sample preparation on-disc and delivers it to a test chamber where the optical interrogation will take place, using the centripetal force created once the disk is spun at high speed. The challenge presented to CIT by Radisens was to explore optical schemes for sample excitation, collect scattered and fluorescent light and detect low light for their Lab-on-disc platform.

This challenge has been addressed for large scale laboratory equipment but these incumbent systems have comparatively no constraints in terms of footprint and in reality no limits in the choice of optical components or subsystems with respect to cost or performance. Therefore the challenge is to provide the required performance in a cost-effective manner.

The Centre for Advanced Photonics & Process Analysis (CAPPA) engages in industry focused



*Jerry O'Brien, CEO,  
Radisens Diagnostics*

applied and fundamental research in optics and photonics. CAPPA's expertise and facilities in optical design, numerical modelling and advanced optical characterisation were of particular relevance to Radisens' research needs.

The research focused on investigating novel integrated optical schemes designed to meet the needs of the next generation of Point of Care (PoC) diagnostic technologies currently under development by Radisens Diagnostics. ➔

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- The activities were concentrated in a number of key technical areas:
- Laser sources for optical excitation of the sample under test.
  - Numerical modeling, design, realisation and testing of candidate optical schemes.
  - Design and modeling of approaches to increase the efficiency of fluorescent light extraction
  - Realisation of a novel micro-optic array element using a low cost injection moulding process
  - Integrated testing of the micro-optic array in Radisens' cytometer test bed.

This project was jointly funded by Radisens Diagnostics and Enterprise Ireland under the Innovation Partnership programme. Apart from the financial contribution to the project costs, Radisens also provided dedicated engineering resources, equipment and facilities as necessary during all stages of the research.

The research has demonstrated low cost optical schemes required to develop a PoC flow cytometer. Specifically a novel micro-optic array capable of direct integration into the microfluidic flow channel has been designed, modelled, realised and tested. The micro-optic array was fabricated using a standard injection moulded process and is capable of scaling up to high-volume manufacturing. Initial tests have demonstrated increased collection of fluorescent light for the array over standard channels.

The developed technology has the potential to be commercially exploited by Radisens to help underpin their Lab-on-disc flow cytometer technology platform. As part of the close collaboration and knowledge transfer fostered by the programme CAPPa has also provided optical support and input into other areas of the company's ongoing technology development. ■

## TESTIMONIAL

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**Lee Barry**  
Radisens Diagnostics

*"Radisens Diagnostics were very happy with the work performed by CAPPa for us on this project. CAPPa provided very thorough and timely feedback and regularly met and communicated with us to ensure a well run project. Radisens were able to test a specific laser source using CAPPa's optical test infrastructure. The company demonstrated to potential overseas customers that we have access to larger facilities, overcoming their reservations about working with an early stage SME. The research confirmed that the laser could be used and proved that a lensed microarray will work for our system. Having a design for such a lensed microarray that is manufacturable was an important output. Additionally the work confirmed that our choice of plastic material is suited to the intended application. CAPPa also developed methods for pumping and handling the fluids that will be directly applied to Radisens' next stages of development – even though these were not explicitly part of the workplan. Radisens now have fully detailed models of our optical system that can be used to improve overall system design"*